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Occasional Papers on the Kinds of Plants

By L. H. Bailey

4. Erythea
5. Brahea

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46. FLOWERING TREE of the Guadalupe palm, *Erythea edulis*. Southern California. Trunk of *Erythea Brandegeei* at left.

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ARTICLE 4. ERYTHEA – THE HESPER PALMS.

In his Botany published as part of the Geological Survey of California in 1880 Sereno Watson established the genus Erythea to accommodate a palm, *E. edulis*, from the Mexican island Guadalupe which lies "about one hundred miles from the coast of Lower California, and two hundred and thirty west of south from the town of San Diego, which is near the southern line of California" as detailed in his account of the flora of that island in 1876, and also to include another species, *E. armata*, from "the Big Cañon of the Tantillas Mountains, about eighty miles southeastward from San Diego."

The generic name is "one of the Hesperides, daughters of the Evening or the West" who, in the Greek mythology, dwelt on an island on the western edge of the world and who guarded the golden apples there. With this pretty fancy is now associated a group of a half dozen palmetto-like fan palms in northwestern Mexico, most of which are in cultivation in suitable regions. They are attractive and adaptable horticultural subjects. In English, Hesper or Hesperus is a poetic name for the evening star, shining briefly after sundown; and its connotation is the Ultimate West. The name is pronounced as if spelled Erytheè a.

When first brought to the attention of botanists, the palms *edulis* and *armata* were referred to the genus Brahea, but Watson disclosed the technical differences between the two groups. Many years later O. F. Cook broke the genus in two, retaining *E. edulis* but separating the other species as *Glaucothea armata*, and still later I. M. Johnston placed the three other Hesper palms then known in Glaucothea. Subsequent studies have not confirmed the distinctions between these proposed genera but rather have weakened them and I have not felt justified in maintaining the separations.

Three monographic treatments of Erythea have appeared. One is by Beccari in Webbia, 1907, in which five species are recognized. The second is by Marcus E. Jones in 1929 but continued in 1933 in his Contributions to Western Botany; in these papers Jones accepts the five species; he adds a new one, *E. loretensis*, but this novelty is a Sabal and will be discussed when I revise my Palmetto monograph. The other account is in the posthumous work of Beccari "revised and edited by Prof. Ugolino Martelli" in Annals of the Royal Botanic Gardens, Calcutta, 1931; although this publication is entitled Asiatic Corypheæ it nevertheless includes palms of America; *E. Roezlii* is here added, making six true Erytheas. Beccari and Martelli, of course, were unaware of the publication of Jones'

47. FRUITING AND FLOWERING TREE of *Erythea edulis*; planted in southern California.

Erythea loretensis. The writings of Cook and Johnston on Glaucothea are also practically monographs of the genus.

The relationship of Erythea in the North American flora is with Sabal, although botanically Watson and Beccari contrast it with Livistona. The species apparently lack, however, the singular oblique subterranean trunk development of the Sabals.

Aside from *E. edulis* and *E. aculeata* the species of Erythea are remarkably similar in botanical characters, however different they may seem to the grower. The four glaucous species appear to be geographical developments of one general type. It is in cultivation that differences in vigor and size as well as in hang and aspect of leaves are prominent. Fruit characters are difficult to contrast from the fact that fully ripe drupes with final exterior surface intact are not often available. Fruits not naturally developed, even if the seed appears to be mature, are likely to shrivel, epidermis becomes tight and hard, and the conformation and markings are lost; then there may remain little reliable difference in size or other features between the species.

The problem of Erythea is complicated by the fact that its wild territory has not been diligently explored for palms. On the Peninsula, in particular, we cannot be certain in many cases whether the palms about springs and oases are native or have sprung from seeds carried by vague journeyers over many years. The presence of well-established Phœnices in such places raises questions, inasmuch as these are Old World palms.

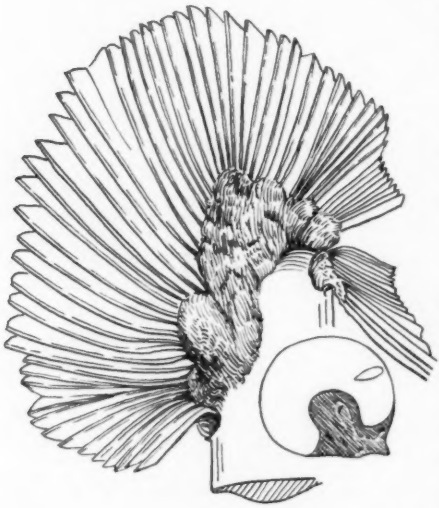
ERYTHEA, Wats., in Bot. Calif. ii, 211 (1880). HESPER PALMS.
Glaucothea, O. F. Cook, in Journ. Wash. Acad. Sci. v, 237 (1915).

Hermaphrodite fan-leaved tree palms with single erect trunk at length becoming nude, spadices interfoliar: leaves with large palman and many segments that are either stiffish or drooping, green or variously glaucous, hastula for the most part short and broad or at least not commonly produced into a long point (unless in virgin trees), petiole with plain or spinose margins and glabrate or pubescent-tomentose, blade glabrous or becoming so although in some species waxy and only lightly if at all filamentose: spadices much branched and myriad-flowered, shorter or longer than leaves, pubescent or tomentose, with a single tubular perhaps flat-edged spathe covering the produced peduncle and scarious sheathing spathelets at the nodes, the dead framework often hanging after fruit-fall: flowers very small, sessile, with 3 valvate corolla-lobes and 3 shorter calyx-lobes or sepals; stamens 6 and not much if any exserted, attached to base of corolla and more or less connate, the free part of the filament prominently dilated, anthers small; pistil of 3 nearly separate or coherent carpels only one of which usually matures, tapering to a point or with 3 minute stigmas showing: fruit irregularly globose to ovoid and more or less drupe-like, lightly lop-sided or perhaps one side slightly flattened, black or purplish and glabrous at maturity, exocarp somewhat fleshy, endocarp adherent to the globose-oblong seed or free from it; seed very hard, albumen flinty and

homogeneous (not ruminate), excavated or concave on lower side and cavity filled with the podium or brown testa, embryo oblique-lateral and opposite the raphe.

Species two, in the original description, *E. edulis* and *E. armata*, neither one designated as type and diagnosis equally applicable to either one; four species have been added subsequently. Native in canyons and hills, northwestern Mexico, in the states Sonora and Sinaloa, territory of Baja California and on Guadalupe Island to the west. They thrive when grown in southern California and are planted elsewhere in the United States as well as in southern Europe. In cultivation they are likely to be confusedly named.

Cook's genus Glaucothea is contrasted with Erythea on the assumption that *E. edulis* is the diagnostic type of the latter genus. Glaucothea is constituted primarily on the very waxy-glaucous nature of the leaves; this character is not constant enough among the species now included in Erythea to constitute a basis for separation. In fact, the glaucous color is very variable in *E. armata* itself, which is the Glaucothea type. Further differences are stated by Cook, and others are added by Johnston in 1924 as the result of his collections on the Gulf of California (Proceedings of the California Academy of Sciences, Fourth Series, xii, 991, 992). These differences lie not in organs commonly accepted as carrying primary generic characters, whereas such characteristics (as in flowers and fruits) unite rather than divide the species.



48. HASTULA AND CROSS-SECTION OF NUTLET of *Erythea edulis*. Former about one-half natural size; nutlet about full size.

The green foliage color of *E. edulis* is a mark of *E. aculeata* also, and green forms appear in *E. elegans* and *E. Roezlii*. Flower-clusters not exserted beyond the foliage is not peculiar to *E. edulis*, as once supposed, but is equally characteristic of *E. aculeata*, *E. elegans* and usually of *E. Brandegeei*. Spinelessness of the petiole, often made a definite mark of generic separation, does not hold in *E. edulis* inasmuch as many of its petioles bear small spinous elevations; and on the other hand, one may

find a tree of the very spiny *E. armata* in a native grove that has perfectly spineless petioles, and I have such an example in my collection. The floral and fruit structures are strikingly similar through all the species.

Flower structure is displayed in the pictures, but a paragraph may be devoted to the fruit. Distinctions have been made between endocarps adherent to the nutlet and free from it; but while such contrasts exist it is difficult to make the observations without fully developed and mature fruits, and in any case it is doubtful how far they are diagnostically important.

The gynœcium of Erythea consists of three carpels only loosely joined or coherent at base to a common podium. Usually, only a single carpel develops to fruiting stage; the fruit may be flat-sided, as if misshapen. The exocarp or epicarp may become a pulpy or a corky covering; in some cases the mesocarp is fibrous and prominent, as when mature dry fruits of *E. aculeata* are boiled up; the endocarp spreads from the podium around the seed or nutlet. In the growing state and even in fruits full grown but not mature, the endocarp adheres closely to the nutlet and is hardly separable; in fully ripe fruit the endocarp may adhere to the nutlet more or less loosely when the outer shell is removed and it may exhibit a particular conformation (B Fig. 71); therefore, one cannot contrast a fruit of one age with that of another age. When fruit has lain from a preceding crop, all the integuments may have vanished and the bare seeds are the familiar smooth brown worn pebbles one picks from the ground, with a flattened side, attachment point, and a micropyle.

In spite of these agreements, *Erythea edulis* remains a distinct and separate species, and it cannot be confused with the others in diagnosis. The major problem in Erythea, however, lies not in generic separation but in clear specific diagnosis of the group we have known as *E. armata*. This set of Erytheas is not yet understood.

A. Leaf-blades uniformly green on both surfaces (not glaucous): spadices shorter than the leaves at least when in bloom: petiole spineless or bearing only very small simple teeth 3 mm. or less long.

B. Petiole of full grown leaves very heavy and strong, 4 cm. or more broad, mostly without spines or calluses, the base covered in cloth-like sheaths on the trunk (derived from the split petiole-sheaths): fruit large and at maturity soft with thick edible pulp: heavy stout tree, with big leaves: frequent in cultivation..... 1. *E. edulis*

BB. Petiole very slender, not exceeding 2 cm. broad, bearing many small contiguous teeth, not prominently covered in sheaths at the base: fruit hard and spongy: small slender tree, not in cultivation... 2. *E. aculeata*

AA. Leaf-blades conspicuously glaucous on at least one surface (unless in No. 3 when planted unnaturally in heavy shade): spadices exceeding the leaves or at least fully equalling them, often very much surpassing them: petiole habitually strong spine- (or prong-) margined, the base not manifestly involved in cloth-like sheaths. All of them in cultivation.

B. Foliage moderately glaucous, or only on under surface: leaves not stiff and tin-like; petiole usually not exceeding 3 cm. broad except at expanded base, and often less, the spines not generally more than 5 mm. long: fruit at full growth but not yet mature not showing a close network surface when dried, the epicarp perhaps soft.

c. Under and upper surfaces of leaf thinly glaucous: spadices in anthesis heavy and showy, thickly flowered, and prominent in or beyond the foliage: mature fruit with crust-like exterior, nearly globular, not varicolored, often more or less pyriform but before maturity with elongated look ..... 3. *E. elegans*

cc. Under surface of leaf thinly glaucous, upper surface green: spadices thin and not abundantly thickly flowered, not much if at all extending beyond the foliage and often almost hidden by it as they droop: mature fruit with thin papery shiny exterior with spots and longitudinal marks, oblong-globular ..... 4. *E. Brandegeei*

BB. Foliage habitually prominently glaucous-blue on both surfaces (with exceptions now and then): leaves stiff and the tin-like palman difficult to bend by hand; petiole broad and stout, with some of the spines likely to reach 8 or 10 mm. long or even more: spadices long and extending outward beyond the foliage and curved: fruit at full maturity with thin covering not soft or pulpy.

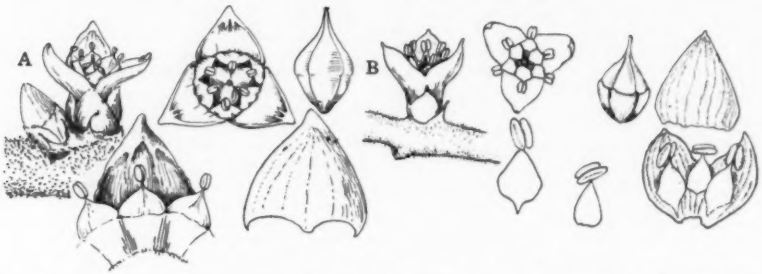
c. Arms of inflorescence (spadices) very long and hanging prone, longer than the top and the shag, the individual thyrses 60-75 cm. and more long and composed of many very slender thread-like long hanging rachillæ: leaves very blue, and waxy covering usually evident to the feel and the lens; petiole usually bearing tawny-tomentose patches or covering (particularly toward base), the spines close together and 8 mm. or less long and ends often hooked: fruit long in maturing, not manifestly one-sided, longer than broad and more or less narrowed to apex, commonly striped or splashed at maturity ..... 5. *E. armata*

cc. Arms of inflorescence divaricate or arching beyond the head but not much longer than the top and not hanging prone, the individual thyrses 40-50 cm. or less long and with short simple stout divaricate rachillæ: petiole little or not patchy-tomentose, the spines slender and well separated (10-20 mm. long) and ends mostly not hooked although perhaps curved: fruit with a flattened side, the periphery nearly circular so that dimensions lengthwise and crosswise are practically equal, when not completely mature wrinkled in the form seen in Fig. 68 bottom ..... 6. *E. Roezlii*

1. **Erythea edulis,** Wats. in Bot. Calif. ii, 212 (1880). GUADALUPE PALM. Figs. 46, 47, 48, 49, 50.

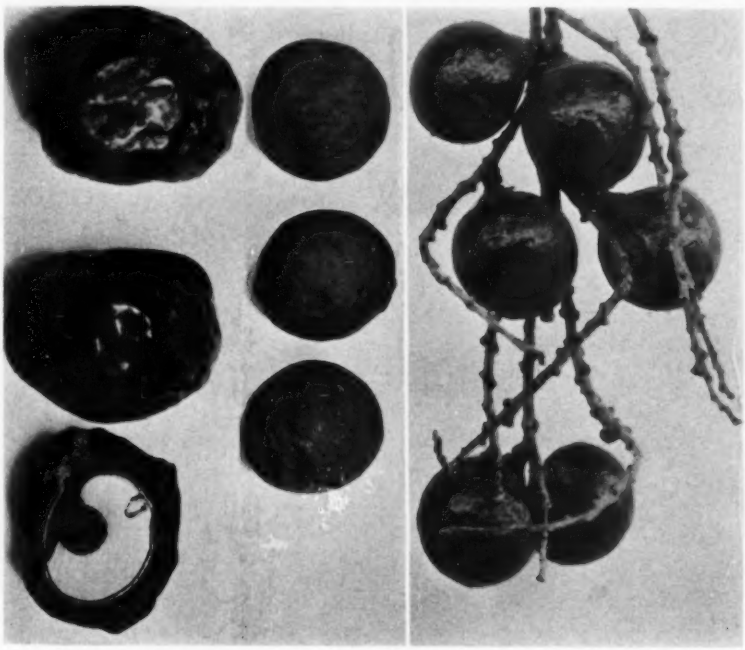
Brahea edulis, Wendl. ex Wats. in Proc. Amer. Acad. Arts & Sci. xi, 120, 146 (1876).

Stout tree to 10 or 12 m. high, the columnar trunk to 4 dm. diameter and showing many irregular rings, soon becoming bare, the crown or coma large and bearing a dozen and more heavy very green (not blue or glaucous)



49. FLOWERS MUCH ENLARGED of *Erythea edulis* at A, and *E. aculeata* at B; showing natural position, top open view, pistil, stamens, and separate corolla-lobe.

leaves which are attached in heavy brown fabric-like shag: petiole to 1½ m. long, rather slender, above basal enlargement 4-6 cm. in width, more or less filamentose at base, shallowly concave, obscurely scarious-pubescent on upper face, margins either bare or possessed of many separated often curved callous teeth 1-3 mm. long, readily pulled off when the leaf dies and leaving a ringed bole; blade 1-2 m. across, the many segments erect or overcurved and separate to perhaps one-third or one-half the length of leaf, all finely many-nerved lengthwise and often waxy, each of them 3 cm. or less broad, apex long-tapering and briefly bifid, filaments not prominent, hastula (Fig. 48) short broad and unequal sided, frequently bearing a mat of wool or tomentum at top, 4-7 cm. long: inflorescence shorter than leaves and often not surpassing the petioles, greenish-white in anthesis, conspicuous by its billowing abundant clusters of hanging strands; rachillæ 10-30 cm. long and often 2- or 3-forked, pubescent-tomentose but becoming glabrate in fruit: flowers solitary or in small clusters, about 3-5 mm. long, anthers conspicuous in anthesis but not exserted: fruiting cluster a heavy hanging narrow strand 1-1.5 m. long and sometimes weighing 30 to 50 pounds: fruit a black globose or oblong-globose drupe 25-35 mm. diameter, somewhat flattened on side toward insertion, pulp soft, much wrinkled



50. MATURE FRUITS OF THREE ERYTHEAS, about natural size. Left, *E. edulis;* center, *E. aculeata;* right, cluster of *E. elegans.*

when dried; nutlet oblate, about 20 mm. diameter crosswise, the cavity extending half or more its height, the embryo and micropyle lateral, surface brown without definite markings.

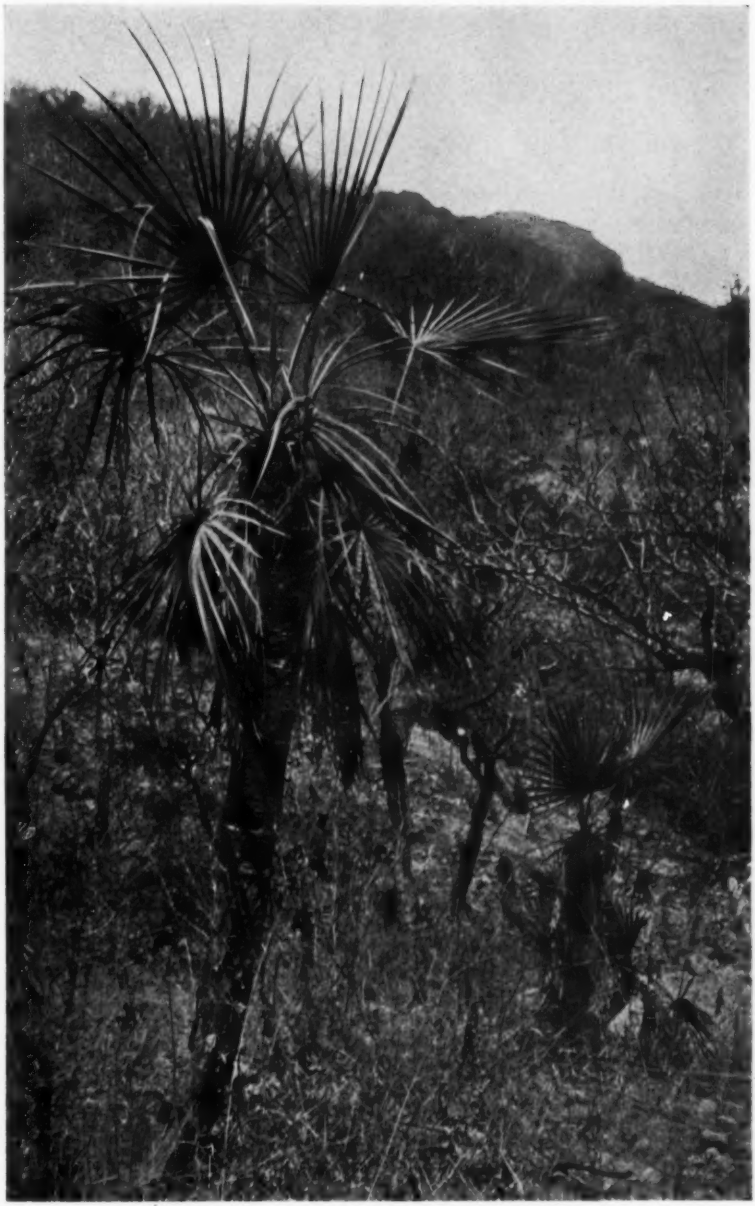
Guadalupe Island, Mexico (in the Pacific about 29° N. Lat.), "frequent in deep warm ravines, from the northern end to Jack's Bay," as recorded originally by Watson; "the fruit is eaten by man, goats, birds and mice"; collected by Dr. Edward Palmer. Reported as now becoming rare on the Island.

Type specimen of *Erythea edulis* in the Gray Herbarium is a sheet showing one branch of inflorescence; a drupe 29 mm. long and 23 mm. broad; sections of nuts, from one of which the fruit in Fig. 48 is drawn; a letter from Wendland under date of August 14, 1875, in which two specific names were suggested for the palm and of which Sereno Watson chose *edulis;* all the materials on this sheet are of Palmer's collecting on Guadalupe, 1875. Another sheet is a later acquisition showing a flowering piece from a tree grown in San Diego from Guadalupe seeds and of which specimens were once distributed under another but unpublished binomial.

2. **Erythea aculeata,** Brandegee, in Zoe, v, 196 (1905). SINALOA HESPER PALM. Figs. 50, 51, 52, 53.
Glaucothea aculeata, Johnston, in Proc. Calif. Acad. Sci. Ser. 4, xii, 993 (1924).

Slender tree 6 m. or less high with ringed trunk to 3-4-5 m. and perhaps 2 dm. diameter and open head of relatively few small leaves yellowish-green on both surfaces with 30-40 long segments: petiole slender and glaucous, to 60 cm. long and 15 mm. or less broad, flat on upper surface and convex underneath, the thin margins bearing separated sharp callous simple spines or teeth 2 mm. and less long, hastula small and hyaline and unequal-sided and not extended into blade: the blade thin, about 50 cm. across, divided half or more to the middle, segments 2 cm. or less broad and tapering into very long slender deeply bifid points and with many close lengthwise nerves but little drooping although the entire leaf may be declined, a slender filament or thread in many or most of the sinuses: spadices shorter than leaves, slender, branches 3-5 and only once-branched or perhaps some rachillæ again forked, axes pubescent-tomentose; spathelets short and broad and purple at apex: flowers solitary or clustered, about 3 mm. long, acute petals twice or more as long as calyx, anthers prominent in full anthesis but not exserted: fruit 20-25 mm. diameter at maturity, nearly globular except for a slightly flattened side, in some cases with tapered ends and perhaps 28 mm. long, with uniform surface that usually bears short longitudinal brownish marks; nutlet oblate, about 15 mm. across, contained loosely within the thick corky fruit-shell, the excavation extending more than one-half the diameter, embryo upper-lateral.

Collected by T. S. Brandegee October 26, 1904 near Cofradia, state of Sinaloa, Mexico, where he found it, about Cerro Colorado, abundant but



51. ERYTHEA ACULEATA in the wild, state of Sinaloa, Mexico.

not in bloom. Type sheet is in the Herbarium of the University of California, representing a complete leaf and fruits, with part of a spent spadix.

In April, 1934, I made a journey beyond Cofradia (Cofradeè-a), some twenty-five or thirty miles eastward by road and trail from Culiacan, capital of Sinaloa, and found the palm scattered on dry rocky ground among bushes and small trees, in both flower and old fruit, at the base of Cerro Colorado in a wild territory known locally as "Brasil." It was not abundant in the region I visited and seemed not to be much known, yet there was enough of it somewhere in that territory to load burros (Fig. 52) I met on the road, buried in leaves to be sold in Culiacan. The tallest tree I saw was about 10 feet high and the trunk 4 or 5 inches in diameter, with the general look of a Thrinax (Fig. 51).

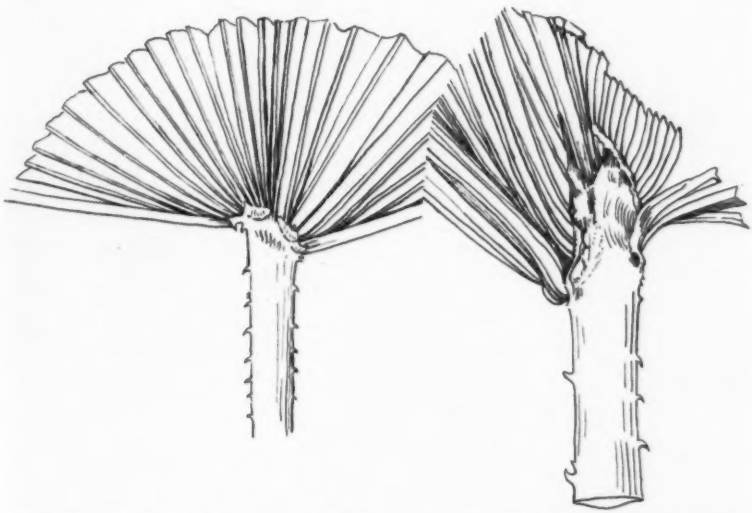
This palm has been elsewhere collected in Sinaloa, by Edward Palmer and E. A. Goldman even before its discovery by Brandegee. Palmer's collection (No. 1646) was at a railroad camp, Lodiego near Culiacan, in 1891. He noted that it grows 8 to 10 feet high, with small tops, and speaks of it as a new species. He found it "on grassy hills." Goldman's collection (No. 363) was at La Rastra, Sinaloa, in 1899, at an altitude of about 2000 feet. In 1910 it was taken at San Blas, Sinaloa, by Eugene A. H. Tays. He speaks of it as a "mountain palm." These specimens I have seen in the National Herbarium. Probably other collections are in herbaria.

The Sinaloa Hesper is not in cultivation to my knowledge, nor did it look promising to me as a horticultural subject as I saw it beyond Cofradia. When Brandegee was asked for seeds to plant, he spoke of it as an inelegant palm, having few rigid erect leaves. Palmer stated, however, that it will prove to be a good palm for cultivation.

3. **Erythea elegans,** Franceschi, ex Becc. in Webbia, ii, 138 (1907). FRANCESCHI PALM. Figs. 50, 53, 54, 55, 56.
Glaucothea elegans, Johnston, in Proc. Calif. Acad. Sci. Ser. 4, xii, 993 (1924).

Tree with short trunk as known in cultivation, either a dwarf species in cultivation or else a very slow grower, only a few feet high (about 1 m. thus far) but stout and likely to be covered with dead hanging leaves: crown or coma large and open, composed of 15 or more long-stalked graceful leaves of which the lower ones decline attractively, both surfaces thinly glaucous (unless when growing in shade) but the under side more prominently so, the filaments or threads few and short: petíole 65 cm. and more long, 2 cm. broad near base, tenaciously clinging, bluntly keeled underneath and nearly flat above, glaucous and sometimes carrying tufts of tomentum, bearing well separated single or sometimes double callous spines throughout its length and 5 mm. or less long, hastula unequal-sided and irregularly narrowed or pointed and not exceeding 3 cm. long; blade 75 cm. and more across, rather thin in texture, the 50 or more segments extending about

52. BURROS LADEN WITH LEAVES of *Erythea aculeata*. Mexico.



53. HASTULAS OF TWO ERYTHEAS, about two-thirds natural size. Left, *E. aculeata;* right, *E. elegans*.

54. CHARACTERISTIC TREE of *Erythea elegans* in fruit; planted 1900. Southern California.

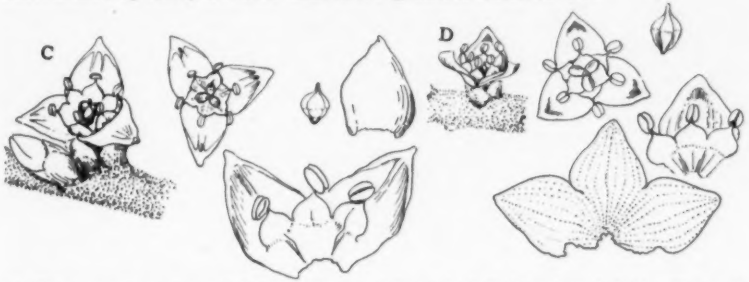
one-half or more to the center with the widest ones 3 cm. broad and most of them less than that, the apex (particularly of lateral and basal ones) developed into long narrow bifid point, finely many-veined lengthwise, under surface somewhat waxy-punctate: spadices about equalling the leaves or only a little exceeding them on heavily foliaged trees, erect or ascending until weighted by heavy bloom or by fruit and then gracefully bending over, much branched and abundantly flowered so as to be particularly attractive in bloom, rachillæ slender and pubescent-tomentose, free end of spathe-valves short and nearly obtuse: flowers 3-4 mm. long, petals narrow and sharp in anthesis and short-stalked anthers then prominent, ovary short: fruit ripening very early, usually more or less pyriform or narrow-oblong when young but if fertilized becoming oblong-globular at maturity and a little unequal-sided, glabrous although conspicuously pubescent when partly grown, 18-22 mm. long and 1-3 mm. narrower, the ripe ones likely to show lengthwise low creases but without markings; nutlet rather loose in the crusty shell, oblate, 14 or 15 mm. broad and 8 or 10 mm. high, the cavity-column extending more than half way through it.

Sonora, Mexico, according to Franceschi and as accepted by Beccari although it appears not to have been seen by palm collectors in a wild state. Frequently planted in southern California. My account has been drawn largely from trees on the grounds of J. Harrison Wright at Riverside who obtained them from Franceschi in 1900. The tree fruits when only 4 feet high.

The earliest account of this plant I know under name is by Dr. F. Franceschi in a "supplement to catalogue" of the Southern California Acclimatization Association, January 1, 1905, but not sufficient to constitute botanical publication. The entry is as follows:

ERYTHEA ELEGANS, Sonora.....$1 to 2.50
The dwarfest of the four species of Erytheas known; builds only a very short trunk; foliage very fine and graceful; flower scapes feathery; fruits yellowish.

In Franceschi's catalogue dated Easter, 1900, is probably the first offering of this palm, as "Erythea sp. nova. Sonora. A new and undetermined species, dwarfer and more graceful than *edulis*."



55. ENLARGED FLOWERS of *Erythea elegans*, left, and of *E. Brandegeei* right. Flower in position, top view, pistil, stamens, opened corolla-lobes.

Nativity of the Franceschi palm is really not known. The type tree of Franceschi was on the Buddington place, College Street, Los Angeles, having been planted there in the 1880's as a small seedling from John Rock's nursery in San Jose. Two types are known, one with more or less pendent foliage with drooping segments and the other with segments maintained in the plane of the blade itself. One form has specially broad leaves. There appear to be no botanical differences between them, however, and they are undoubtedly such variations as one may expect in palm seedlings.

The "type tree" on the Buddington place has now perished. Photographs of the tree in its last stages were sent me in 1927 by Ernest Braunton, and one of them is reproduced in Fig. 56 as of possible historic interest. Mr. Braunton calls attention to the old flower-stems being pulled down, "the work of boys, I think."

56. The "type" tree, when in its last stages, from which Franceschi obtained his seeds of *Erythea elegans*.

The Franceschi palm has been imperfectly described and therefore misunderstood. Beccari had a young leaf from Franceschi's nursery and described the petiole as spineless. The fully ripe fruit is only indifferently pyriform and attenuate to base although this description might apply when immature, and Beccari stressed this shape. The body of the fruit is nearly globular but often looks narrower at basal end particularly when seen from the side, in consequence probably of the failure of the other carpels to develop.

57. HISTORIC PICTURES of three trees of *Erythea Brandegeei* in native places at southern end of Baja California and one (lower center) of *Washingtonia robusta*, taken in 1900 by Kate Sessions, who has been very helpful in the study of these palms.

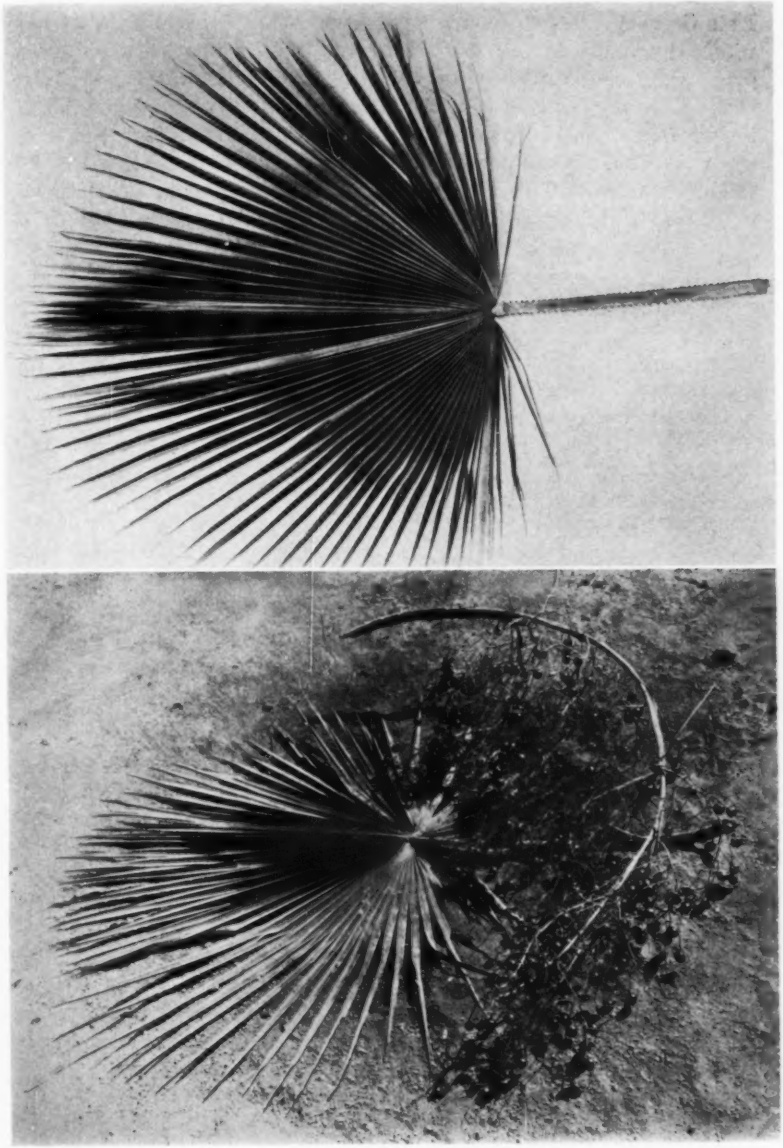
4. **Erythea Brandegeei,** Purpus, in Gartenflora, lii, 11 (1903). SAN JOSE HESPER PALM. Figs. 55, 57, 58, 59, 60, 61.
Glaucothea Brandegeei, Johnston, in Proc. Calif. Acad. Sci. Ser. 4, xii, 992 (1924).
Brahea Brandegeei, Hort.

Slender palm in nature, trunk 10-12 m., wood very hard, trunk sometimes not quite straight in age, obscurely ringed, bearing an open loose head with upper leaves ascending and lower ones drooping, dead leaves hanging under the crown unless cut or burned: leaves dull green above and conspicuously glaucous with waxy bloom underneath, the segments usually overbent or arching at the end, filaments or threads short and not numerous or prominent; petiole long and slender, plano-convex in section, 1 m. or more long and 3-4 cm. broad toward lower end, marked on upper face or at least near base with brownish tufts of tomentum, continuously margined with single and multiple strong tooth-like callous spines to 5 and 7 mm. long, usually with median yellow line underneath, the hastula irregular and broad and not produced into a pointed apex; blade in nature 1 m. and more across, the palman about 40 cm. across and not so extensive as the long slender narrow-pointed segments, the latter sometimes 4 cm. broad at base but commonly narrower, longitudinal veins many and close, tips mostly deeply bifid: spadices in the wild not extending beyond the leaves and usually a little shorter and covered in the foliage, horizontal-arched, much branched, pubescent but the many slender ultimate rachillæ becoming nearly or quite glabrous in fruit: flowers small and closely packed on the then densely pubescent rachillæ, about 3 mm. long and equally as broad in anthesis, petals broad and almost blunt, stamens plainly showing: fruit ripening relatively late, with papery puffy exterior, shining smooth brown with flecks and longitudinal markings of lighter color (or the lighter color predominating in which case the stripings are brown), oblong-globular and a little misshapen, variable in size, from 15-22 mm. long and 1-4 mm. narrower (Fig. 61 grown in cultivation); nutlet decidedly oblate, 13-15 mm. across and 9 or 10 mm. high, cavity-column reaching about to the center.

E. Brandegeei var. **spiralis,** M. E. Jones, in Contrib. W. Bot. xviii, 29 (1933). Fig. 59 right.

Trunk showing a distinct spiral arrangement of petiole bases, as in Fig. 59, on the grounds of J. Harrison Wright at Riverside, California, grown with other Brandegee trees from Brandegee seeds (1902) from the San Jose del Cabo region. The single tree is somewhat dwarfer than its mates, but this may not be significant. It is the "Tlaco" palm of Brandegee. This palm I have not recognized in the wild. I conclude it is only a growth-form. In the large lot of *E. Brandegeei* growing in Balboa Park, San Diego, are one or two trees giving only a slight indication of such a twist.

The Brandegee Erythea is native in Baja California, in mountains and canyons in the region of San Jose del Cabo at the southern end of the peninsula (latitude about 23°) where it was discovered in October, 1900, by the late T. S. Brandegee and Miss Kate Sessions. Both Brandegee and



58. ERYTHEA BRANDEGEEI. Top, leaf from a tree planted by Brandegee at San Diego. Bottom, leaf and inflorescence fresh from a native tree in southern Baja California.

Kate Sessions brought seeds into southern California, and trees are now widely distributed in that area. Reported by Johnston "in a wild state only in the deep cañon in the Sierra Giganta back of Escondido Bay where it is very common down to about 350 m. altitude. It grows along the stream bed or in sheltered recesses on the mountain side and may become 15-22 m. high although the common height is only about 10 m." This place is about Lat. 26°, near Loreto. Such material as I have seen from there is not convincing.

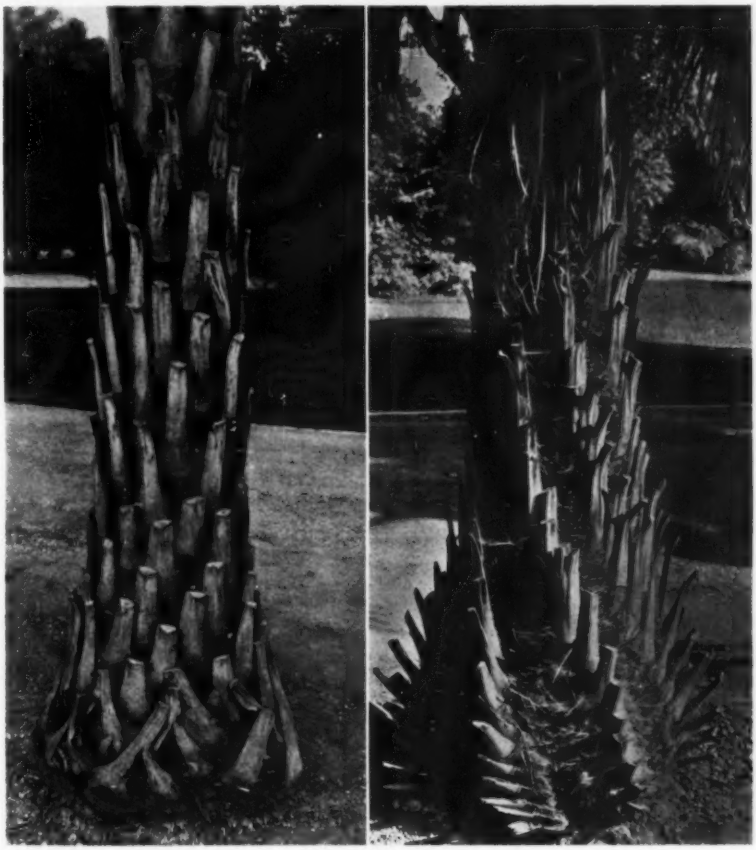
Brandegee writes in 1905 (Zoe, vol. v, 189) that it grew abundantly "in the cañons or often covering mountain slopes on northern exposures. Generally, the dead leaves fall away, leaving a hard, smooth trunk less than two feet in diameter, even though it may reach an altitude of 125 feet. When it reaches a great height, the trunks lose the stiffness of the other species of the genus and wave with the wind. It is known to the people of the Cape Region as 'La Palmia,' and a form of it not well distinguished they name 'Palma negra.' A few trees in cultivation about San Jose del Cabo are called Palma de Tlaco." Purpus in founding the genus speaks of the trunk as 30 meters and more high (*trunco procero interdum 30 m. alto vel ultra*).

In 1936 I visited the *Brandegeei* region in southern Baja. Going south from La Paz I met *E. Brandegeei* first as a wild plant near Santiago, practically under the Tropic of Cancer, although I had seen it as a planted subject somewhat farther north. In the San Jose region I saw it in the mountainous Portesuela country, having made that area through canyons on muleback from Santa Rosa. The trees were not abundant, however, and I was told this palm is not as common as formerly due to demand for the trunks for timber and the devastations of floods. Although many of the trees I saw gave appearance of being very tall because of their slenderness and were in full fruit, yet they did not approach the altitudes stated by Brandegee and Purpus. My outside estimates did not exceed 10 or 12 meters of trunk, in which I was confirmed by natives. The trees were climbed readily for specimens. I suspect Brandegee may sometimes have confused this species with the San Jose *Washingtonia robusta*, which grows very slender and tall although I have not seen it 125 feet.

All the bearing trees I saw had bare trunks except for a short shag of dead leaves under the crown, and I could find only a very few young trees (and those inaccessible) some 10 to 15 feet high that had completely covered trunks. Whether the old leaves had fallen naturally or had been destroyed by fire or had been cut for thatch, I was unable to determine; but palm thatch is frequent. All the trees I have seen in cultivation retain the shag to the base of the bole, or the petioles if the blades have been cut away.

Natives cut into the trunk and tell you the tree is "Palmilla rubia" or "Palmilla negra" by the color of the wood, but the trees are otherwise the same; these are individual or physiological differences, and sometimes the chopper was not quite sure which kind he had. In San Jose del Cabo I saw "Palma de taco" but it is regular *E. Brandegeei: taco*, a plug, stopper or wad, explained to me in this case as having reference to the hard nutlet.

In cultivation, *Erythea Brandegeei* presents many aspects, as in rapidity of growth, glaucousness, hang of leaves. Some of these variations may be seen in the large plantation in Balboa Park, San Diego, which is grown from Kate Sessions' original importation of seeds.

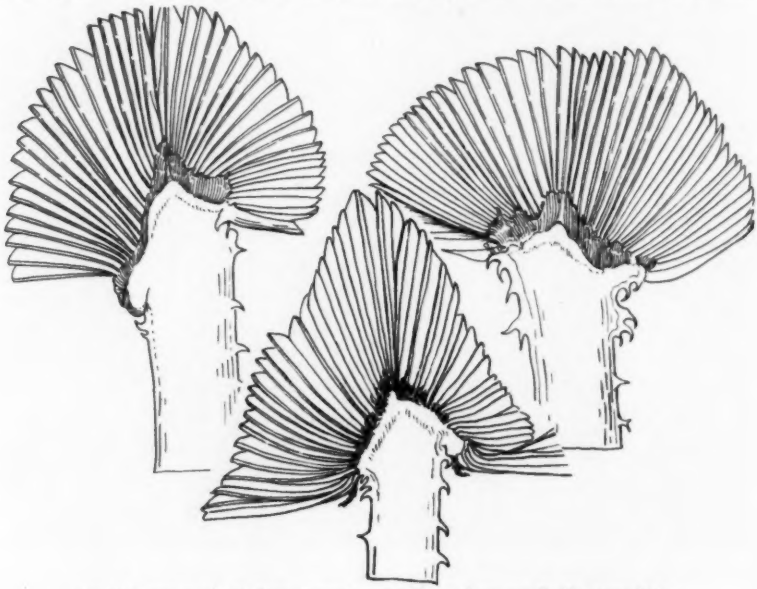


59. TRUNKS of *Erythea Brandegeei;* var. *spiralis* at right. Riverside, California, on grounds of J. Harrison Wright. Petioles remain after leaf-blades have been cut away.

In California the Brandegee palms appear to have a general character somewhat different from that of their native habitat, particularly in the denser more uniform head and in the trunk being regularly covered and therefore not appearing slender. Probably none of them is yet old enough to show characters of age, perhaps not even of complete maturity. Leaf segments are sometimes broader.

Differences between *Erythea Brandegeei* and *E. elegans* are plain enough in the field to the grower but are more difficult to place in terms of botanical contrasts. *E. Brandegeei* is the larger palm, with less showy bloom, stouter, broader and more spiny petioles, leaves greener on upper surface, segments broader in main or central part of blade, the flowers smaller and parts not acute in anthesis, fruit at full growth glossy, papery and puffy, longitudinally marked, later in maturity from comparable inflorescences.

Six Brandegee sheets of *E. Brandegeei* are in the herbarium of the University of California. They confirm the definition of the species as understood in the present diagnosis. My conception of the species is further clarified by leaf specimens taken by me in 1927 from the top of a tree planted in a ravine by Brandegee on his old place in San Diego at the moment when the tree was being buried by the filling in of the canyon consequent on the grading of the property by other owners after his death.



60. HASTULAS of *Erythea Brandegeei*. More than one-half natural size.

Planters must be prepared for confusion in trees supposed to be *Brandegeei*, for seed may not be true to name. I have seeds labelled *Brahea Brandegeei* from a European dealer that are Sabal.

A form with stiffer leaves and scarcely hanging segments is sometimes seen in cultivation, but I have not seen fruits. It is probably only a variant.

5. **Erythea armata,** Wats. in Bot. Calif. ii, 212 (1880). BIG BLUE HESPER PALM. Figs. 62, 63, 64, 65, 66, 67, 68, 71.

Brahea (?) *armata*, Wats. in Proc. Amer. Acad. Arts & Sci. xi, 146 (1876).

Glaucothea armata, O. F. Cook, in Journ. Wash. Acad. Sci. v, 12 (1924).

Brahea glauca, Hort.; Hook. f. in Kew Rept. 1882, 64 (1884); *nomen nudum.*

Big heavy palm with thick trunk often bearing when only a few feet high but probably ultimately reaching 12 m. tall and perhaps even more: foliage characteristically very glaucous and a pronounced blue but nevertheless presenting differences in this regard: shag naturally persistent for many years although in the wild often burned off and frequently the fresh leaves cut for use, probably at length falling naturally: crown or head composed of stiff large leaves beyond which are thrown out long arching or drooping arms of flowers: leaves 1-2 m. across, prevailingly conspicuously and often intensely glaucous on both surfaces and more or less waxy, not spreading flat or in one plane but midrib somewhat prolonged with a consequent slight Sabal-like curve, the blade cut one-half or more its depth into 40 or 50 or more long-pointed strongly veined bifid segments 3 cm. or less broad at middle, filaments or threads few and very short, tips of segments continuing in plane of leaf or sometimes arching downward but not hanging as in old trees of Washingtonia with which it grows in nature; petiole 1 m. or so long, stout and heavy, 5 cm. broad toward base and 2-3 cm. at junction with blade, pubescent-tomentose at least above and much flecked or even covered with dark woolly tufts, margins armed with declined or curved sharp callous spines or prongs to 8 or 10 mm. long and that are more or less contiguously placed or grouped; hastula on bearing trees short and irregularly triangular and with a more or less velvety roll about the margins after the scarious wing is perished and 2 or

61. MATURE FRUITS of *Erythea Brandegeei* (×1).

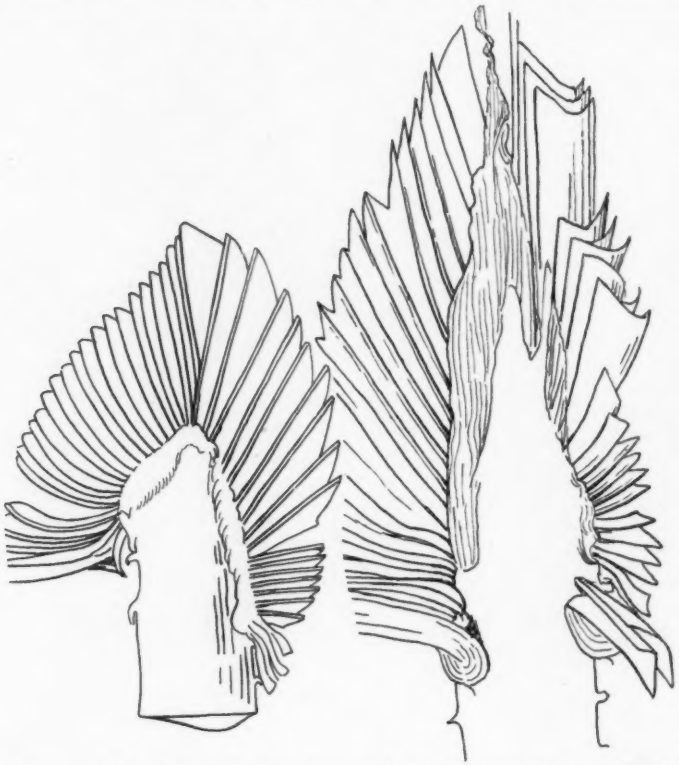
62. REPRESENTATIVE TREE of *Erythea armata* as seen in Cantillas Canyon, Baja California.

3 or 4 cm. long, that on young trees likely to be longer and more pointed: spadices mostly 4 to 5 m. long and hanging boldly to the base of the tree or to the ground outside the foliage and the petticoat or shag, and then bearing well separated clusters or tassels; thyrses 60 cm. and more long and distinct from each other by a space of 20 to 40 cm., composed of many very slender branchlets or rachillæ; spathelets usually produced into a free part 8 cm. or more beyond lowest point of opening: flowers not clustered, subtended by prominent subulate-acute bracts, 3-4 mm. long, the stamens separate at base of the expanded filaments, base of pistil turbinate: fruit nearly irregular-globular to short-ovoid at maturity although somewhat flattened or compressed on one side, oblong in young state and pubescent until half or more grown, at full size usually 18-24 mm. long and 2 or 3 mm. narrower

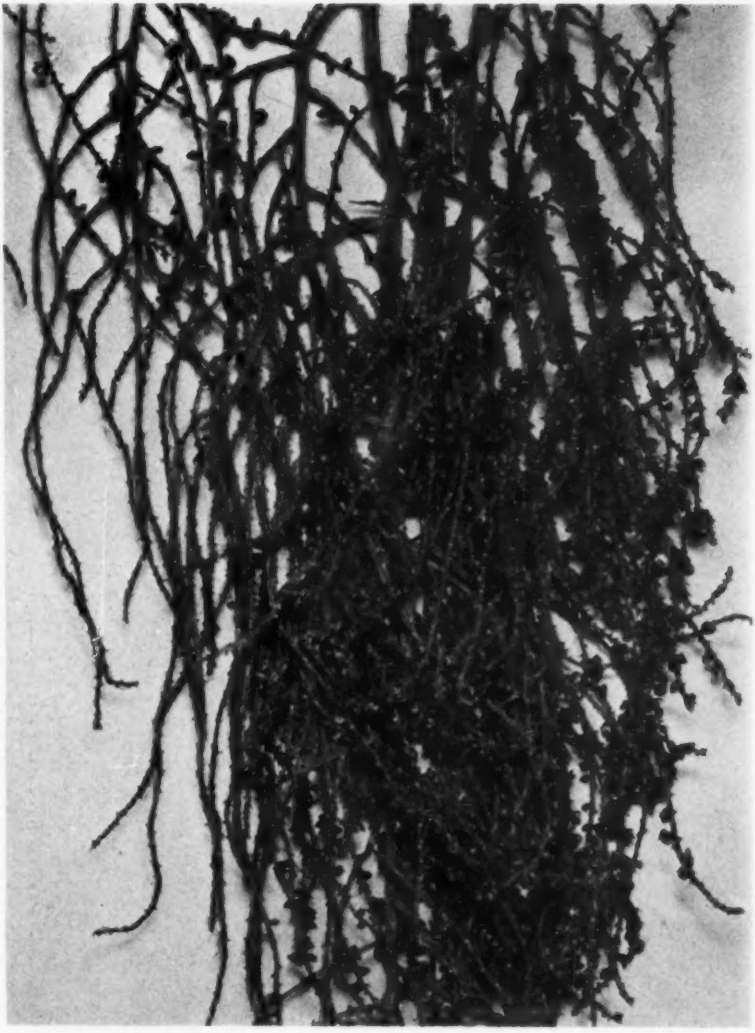
63. WELL-CONDITIONED TREE of *Erythea armata* as planted in southern California.

(but sometimes as short as 11 mm. long and frequently remaining nearly spherical), the surface paper-like and shiny and marked with spots and lengthwise stripes of brown; nutlet oblong-globular but more or less flattened on one side, brown, about 15 mm. either way.

Described by Sereno Watson (under Brahea) in 1876 as from "the Big Cañon of the Tantillas Mountains, about eighty miles southeastward from San Diego." The identity of this locality is not clear, the context showing that Watson apparently thought it to be in San Diego County, California. In his Botany of California, however, 1880, when describing the palm under Erythea, he states that Tantillas Mountains are in Lower California, which is Mexico. Writing in 1890 (Proc. Amer. Acad. Arts & Sci. xxv, 136) he prints the name "Cantilles Cañon." The species has not yet been found native in the United States although common in cultivation; its native distribution is not known to extend southward beyond northern Baja



64. Hastulas of *Erythea armata*, more than one-half natural size, the one at right from a young tree not yet in bearing and the wing still showing.



65. Inflorescence of *Erythea armata*, showing the many slender rachillæ (about natural size).

California, Mexico. Other ranges accredited to it, on the mainland, apparently belong to *Erythea Roezlii*.

This species grows mostly in associations of scattered trees, in rocky and rough canyons where there is under supply of moisture. Often it is a low unkempt looking tree carrying old furniture of dead leaves and bleached fruiting arms. Whether it finally cleans itself completely by the natural shedding of the shag I am unable to state. Usually, as I have seen it, the clean boles have been burned, and if there are no evidences of fire there appears to be insufficient refuse on the ground to account for complete exfoliation. It is stated, however, that the tree trims itself.

Type sheet of Watson's *Erythea armata* in the Gray Herbarium consists of part of an inflorescence in fruit, with fruits and seeds in a pocket, but no flowers. One good fruit measures 22 by 19 mm. The material was collected by Dr. Edward Palmer in "Big Cañon, Tantillas Mts." There is notation of "leaf in case," but this apparently is lost. Another sheet is from C. R. Orcutt, "Cañon Cantilas," 1883, with part of inflorescence in bloom, together with fruits and nuts (Fig. 68).

There appears to be no Tantillas region in Baja California, and undoubtedly the word is an error for Cantillas. The territory in question is south and west of Calexico, California, on the eastern side of the high mountains known as Sierra de Juarez and westward from the flood-lake

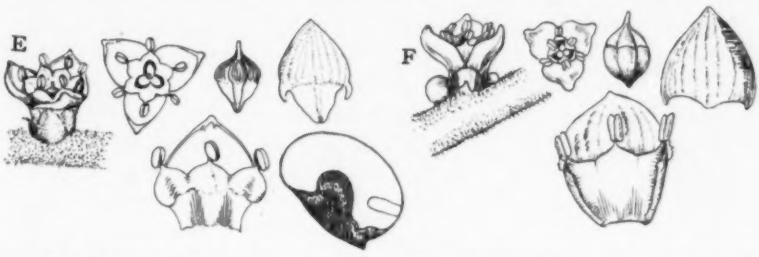
66. TASSELS OR THYRSES of *Erythea armata*, the strongly developed form.

Laguna Salada (Laguna Maguata); refer to a note in the Washingtonia paper page 72 (Gent. Herb. iii). Discovery of a palm in Tajo canyon, in that region, led to a trip there under guidance of Randall Henderson and Malcolm Huey of Calexico, J. Harrison Wright of Riverside and Don Admiral of Palm Springs. There *Erythea armata* and *Washingtonia filifera* were growing abundantly. It turns out that Tajo is apparently the same as Cantillas. Different canyons have been cut in the eastward slope of the mountains, in some of which it is known these palms, one or both, exist; apparently they are known as far north as about twenty-five miles from the International Boundary. It was in his discussion of the Washingtonias, *W. sonoræ*, *W. filifera* and *W. robusta*, that Sereno Watson mentions Cantillas Cañon in 1890; the account is interesting to us in indicating the confusion then current on the identity of these palms.

Definite statement on the location of Cantillas canyon is made by Brandegee in 1905 (Zoe, v): "in Baja California, just below the boundary line near Campo." Location of Campo is in southeastern San Diego County, California. Let no one infer, however, that the Mexican localities are as simple of access as the short distances may suggest.

It appears that the vertical rock faces of the canyon are indicated on Mexican maps as Acantilados Prominentes, and the cow trail leading up into the canyon as Vereda de Tajo. The Laguna Salada ("salty") was an alkali sink at the time of my visit. Some of the visitors to Cantillas have gone in over the mountains to the upper part of it, and this is the easier route. The name is variously spelled.

Much of our early knowledge of the great Cantillas canyon was due to the explorations of the late C. R. Orcutt (who died in Haiti in 1929). It was in August, 1884, as he writes in "Riverside Orange" of 1891 [but it must have been in 1883] that he first learned of the existence of Lake Maguata: "Leaving the forest of piñone pine (*Pinus Parryana*), on the table lands of northern Lower California, behind us, my father and I had



67. Flowers of Erythea, enlarged, showing blossoms in position, top open view, pistil, stamens, separate corolla-lobe. E, *Erythea armata*, Orcutt's collection of 1883, from Cañon Cantillas, now in Gray Herbarium, the fruit about natural size. F, *Erythea Roezlii* from Sonora.

descended the abrupt eastern slope of the mountains, into the great Cantilles cañon, among thousands of lovely Blue palms and stately Washington palms that line the bottom of this famous cañon, which justly rivals the Yosemite in the beauty and grandeur of its scenery."

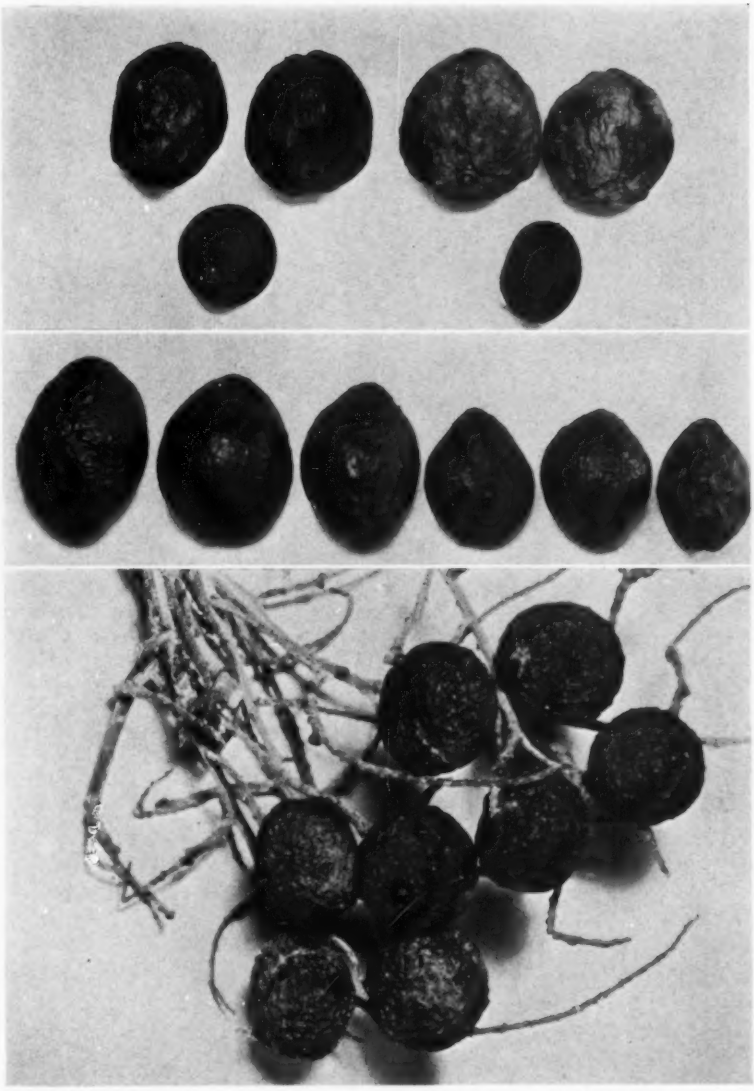
In later years this hidden canyon appears to have passed from the notice of botanical collectors, but I trust these Erythea and Washingtonia collections will revive interest in it and the regions round about.

In this study of *Erythea armata* I have been much aided by several Californians who have contributed specimens, photographs or notes, as J. Harrison Wright, Riverside; Ernest Braunton, Los Angeles; William Hertrich of the Huntington Gardens, San Marino; Randall Henderson, Calexico; Don Admiral, Palm Springs; Ira L. Wiggins, Stanford University; F. F. Gander and Laurence M. Huey and the Natural History Museum, San Diego; John Morley, Superintendent of Parks, San Diego; George E. Lindsay, Lakeside; Howard E. Gates, Anaheim.

A person is halted by such impressive trees as that shown in Fig. 63, which stands in Riverside, California, and the photograph of which was taken by Avery Edwin Field. It is to be remembered that such trees grow under cultivation in good soil, without much competition and with water supply. One hardly expects them in nature, yet they are not infrequent although perhaps not so perfectly developed. In Cantillas canyon I have seen the tassels 20 inches and more long when in fruit, like titanic clusters of grapes. One of the reasons for the downward direction of these long-tasselled arms is the heavy load of flowers and fruits.

Fully mature fruits from a small planting of *armata* gave me the following notes: Very variable in size, shape and color. Some of them show glossy brown-striped exterior, others dull and only indefinitely marked. Largest, 24 by 20 by 17 mm.; smallest 14 by 11 by 8 mm.; gradations all the way between these extremes. Variation in size and shape of mature fruits on a single tree is shown in Fig. 68 center. The fruit of this species is long in reaching maturity, hanging over winter from the summer setting.

The whole subject of variation within the species in Erythea, as in Washingtonia and other genera, is yet to be investigated. Very likely the colonies of *E. armata* in many of the wild places are products near or remote of a single tree or of a pair, as I suppose is the case in many stands of Washingtonia (page 79). In cultivation, also, marked differences appear. Perhaps in time we shall designate some of these departures under horticultural varietal names. It is not enough merely that a species varies; to warrant varietal designation the forms should show sufficient constancy under domestication to make definition and record possible.



68. Fruits of Erythea, about natural size. Top *E. armata*, Cañon Cantillas in Gray Herbarium, 1883, Orcutt. Middle, *E. armata*, all from one tree in cultivation. Bottom, *E. Roezlii*, full grown but flesh shrivelled; Sonora.

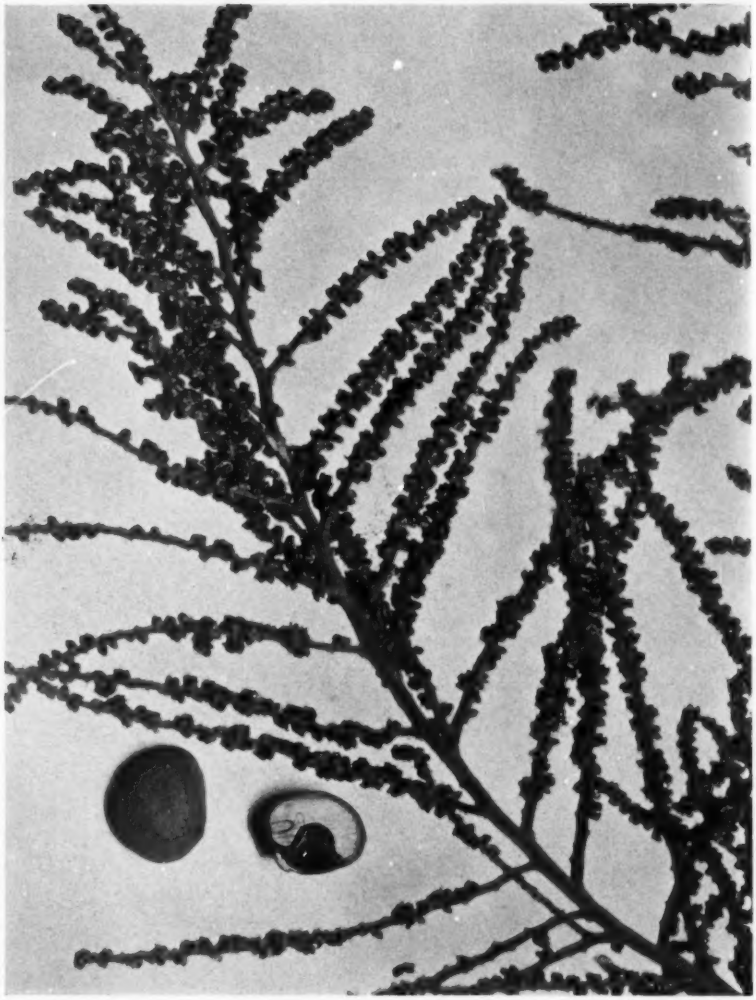
6. **Erythea Roezlii,** Becc. in Ann. Roy. Bot. Gard. Calcutta, xiii, 320 (1931). SHORT-ARM BLUE HESPER PALM. Figs. 67, 68, 69, 70, 71.
Brahea Roezlii, Linden, in Ill. Hort. xxviii, 38 (1881); André, in Rev. Hort. lv, 102-3 (1883); both horticultural accounts.
Erythea armata var. *microsperma,* Becc. in Webbia, ii, 136 (1907).

Probably a more slender palm than *E. armata,* trees in bearing measuring 10-14 m. tall and 30 cm. diameter: trunk probably self-cleaning in time and coarsely ringed, but in young bearing age usually buried in shag unless it has been removed or burned: head close and rather dense, mostly blue or bluish (but in some colonies green for the most part), the leaves usually not showing waxy-powdery covering: leaf-segments stiffish and commonly standing in the plane of the leaf or eventually somewhat declined; petiole usually or frequently glabrous, 3-4 cm. broad at middle, callous-edged, teeth well separated and long and narrow, 8-20 mm. long, straight or curved or less frequently hooked, hastula much as in *E. armata* but sometimes without tomentose roll: spadices 2-3 m. long, standing out well beyond the leaves, upper ones ascending, central ones divaricate and arching but not hanging prone, some of them long persisting in the old shag, the individual thyrses short and rather close together and usually not exceeding 30-50 cm. in length, with the ultimate rachillæ short-divaricate and stout; flowers less than 3 mm. long, bunched or grouped on the rachis and smaller than in *E. armata* and floral bractlets not prominent or subulate-pointed; spathelets usually produced only 4-6 cm. beyond the sinus on the ventral side: fruit scattered in the cluster, at maturity with distinctly flattened ventral side, the general shape nearly circular in outline, at maturity 18-20 mm. in either direction and 15-16 mm. thick, the thin flesh drying into a very hard wrinkled epidermis with prominent line down the ventral side and indefinite ridge at either angle, when fresh and ripe more or less seen with short brownish marks and stripes; nutlet or seed distinctly flat-sided, about 16 mm. long and 12-13 mm. thick.

Sonora and apparently Baja California, Mexico, in canyons and on adjoining cliffs, coming down to the sea in some cases, even to salt water. Nacapule canyon, northwest of Guaymas, thrice visited; Palmar and San Carlos Bay, Sonora, north of Guaymas; San Pedro Bay, Sonora, *Johnston 4340;* northward in Sonora in direction of Hermosillo. At Catavina on the Peninsula (Baja California) at about 30°, on the Pacific slope, as if native, trees very tall. The fruit of this palm apparently matures more rapidly than that of *E. armata.*

It is with hesitation that I adopt the name *Roezlii* for this palm rather than to bestow a new name as I had at first intended. Beccari knew it only in cultivation, and even then in very few trees, so that he may not have seen forms that represent the tree as it occurs mostly in the wild. My reasons for accepting the name are three good characters he mentions,—the short spadices, smaller flowers, smaller subspherical fruits; these are well

69. Representative tree of *Erythea Roezlii* in Nacapule Canyon, Sonora.

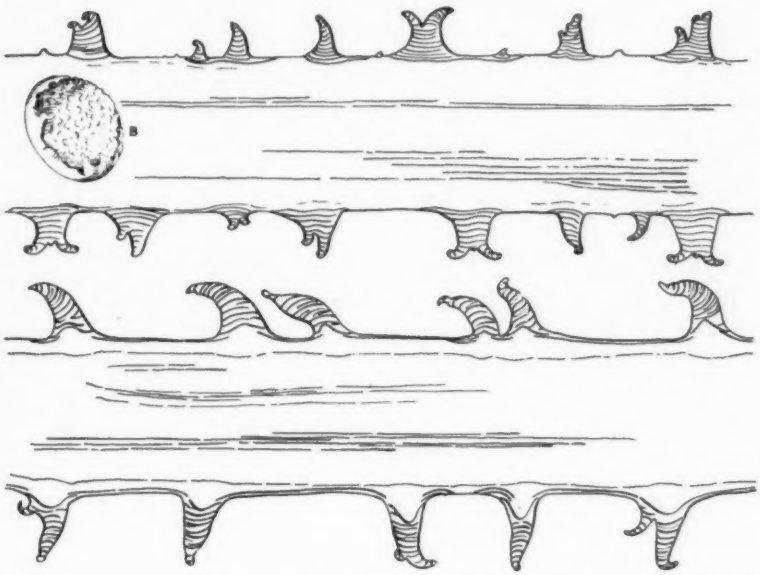


70. PART OF A FLOWER-CLUSTER of *Erythea Roezlii*, to show short stout divaricate rachillæ and clustered flowers; also a seed, and cross-section exposing small embryo and large podium. Practically natural size.

evidenced in the palm I here describe from nature. It is only inconstantly that I have seen it "very intensely bluish-glaucous" nor have I often noted it "conspicuously mealy-waxy on both surfaces"; these features, however, are widely variable in the whole *armata* set; and if I do not adopt *Roezlii* then I am at a loss to place that name. The original horticultural accounts of *Brahea Roezlii* do not aid us in determination inasmuch as the plants then vaguely described were juvenile, in which the blue color is likely to be pronounced. Only a considerable study in the wild over a natural range will be able to define the species (or variety) accurately. I have not recognized this palm in cultivation in America.

Beccari knew a tree of *E. Roezlii* in the garden of the Reale Societa Toscana d'Orticultura in Florence, and he cites a picture in Chabaud's Les Palmiers de la Cote d'Azur (opposite page 94 in that book). The same palm may be seen in a picture taken at La Selva, Nice, printed as a supplement to Gardeners' Chronicle, March 16, 1929. Beccari's *armata* var. *microsperma*, which is his *E. Roezlii*, was based on a tree growing in Toulon, southern France.

Variation in glaucous-blue color of foliage of the palm I now call *Erythea Roezlii* is striking, if one takes pains to note many trees in different



71. PETIOLE MARGINS of *E. armata* above; *E. Roezlii* below. At B a seed partly covered with adhering endocarp.

places. I know a colony in a canyon in Sonora opening westward to the Gulf of California, in which, as my note-book says, some trees have bluish-green leaves but most of them are true green, and not a "blue palm" in the lot as one remembers *E. armata* in cultivation; young plants bluer. In another canyon, only a few miles away, all the trees young and old were boldly blue. This reminds one of the range of color often observed in Serenoa.

For note on B. Roezl, the collector, see the Washingtonia paper, page 59. Account of his travels for Linden, the Belgian horticulturist, may be found in Die Gartenflora, xxiii, page 45, resumed on page 69.

Beccari states that "the precise native haunts of this Erythea (Roezlii) are not exactly known," there being no dependable record of the source of the seeds that B. Roezl introduced into Europe in 1876. He thinks it probable that its native home "may be in the region of San Jose del Cabo at the extremity of Baja California." I did not find any native Erythea in that region, however, other than *E. Brandegeei*.

ARTICLE 5. NOTES ON BRAHEA.

If one follows the synonymy in Article 4 it will be noticed that four of the Erytheas were once named in Brahea; and to this day the overlap persists. The Washingtonias were once called Brahea. These circumstances require explanation of the genus Brahea, and it may bring us to a statement on certain palms that still bear this name in plantations. It is not necessary, however, to go so far as a monograph of the genus: only a cursory view is intended.

Genus Brahea starts with the great Von Martius, who established it in 1838 to include *Corypha dulcis* of Humboldt, Bonpland and Kunth, from southern Mexico. The name is dedication to Tycho Brahe, "summo Astronomo." The first addition thereafter to the genus was *Brahea calcarea*, Mexico, a species proposed by Liebmann and published by Von Martius in 1850. In Beccari's monograph in 1907 he added *B. Pimo* and *B. salvadorensis*, the latter an old Wendlandian name then advanced to publication. In 1934 Burret added *B. psilocalyx* from British Honduras. Eight or nine floating horticultural Brahea names are in the literature, all *nomina nuda* and therefore without botanical standing and impossible of real identification.

With the five accepted species the genus Brahea stood until 1935, when Harley Harris Bartlett of the University of Michigan attacked it and found that only one of the species could be considered a true Brahea, although he did not discuss the recent *B. psilocalyx*. He broke the genus in sunder, retaining positively the original *B. dulcis* and placing *Pimo* and *salvadorensis* in the genus Acœlorraphe. Liebmann's *B. calcarea* he leaves in Brahea until further evidence indicates where it may be placed. Then two new Mexican species are added in Brahea, *B. Conzattii* and *B. Berlandieri*, making three actual members of the revised genus and the waiting *B. calcarea*. Evidence in my own herbarium indicates that *calcarea* is probably a good Brahea.

In redefining Brahea, Bartlett restricts the name to palms in which the flowers are solitary and more or less imbedded in cylindrical quill-like rachillæ, being covered in heavy tomentum so they appear to be immersed; calyx composed of separate stipitate sepals. Fig. 74 discloses the method of flower-bearing on cylindrical axes. This definition conforms to the original diagnosis of Von Martius.

Those species with glomerate flowers Bartlett places in Acœlorraphe, a genus imperfectly established by Wendland in 1879, and for which others prefer the newer name Paurotis (Cook, 1902). Acœlorraphe has been held

to be a monotypic genus, comprising only *A. Wrightii*, native in southern Florida, Bahamas and Cuba, of which *A. arborescens*, *Acanthosabal cæspitosa* and *Paurotis androsana* are synonyms. Bartlett enlarges the scope of Acœlorraphe and adds two new species to it, *A. Cookii* from Guatemala and *A. pinetorum* from British Honduras. In expanding the conception of Acœlorraphe Bartlett states it "should be defined broadly enough to include Serenoa."

72. Brahea dulcis in southern Mexico. Note the stiff leaf-segments.

The two species *Brahea Pimo* and *B. salvadorensis*, with glomerate flowers, go then into Acœlorraphe, retaining their specific names. Burret's *B. psilocalyx* is also a glomerate species; its author compares it with *Pimo* and *salvadorensis*. In his excellent Index of American Palms, 1936, Dahlgren combines *Brahea psilocalyx* and *Acœlorraphe pinetorum* by placing them as synonyms under the well known *A. Wrightii* (Field Mus. of Nat. Hist. Bot. Ser. xiv).

As the case stands at present, we have four described species of Brahea proper. This situation we may now expose. In making this exposition we shall be surprised at the small amount of material in the collections and the few published photographs. Even *Brahea dulcis*, first described by Humboldt and associates one hundred and twenty years ago, is yet imperfectly undrstood.

BRAHEA, Martius, Hist. Nat. Palm. iii, 243 (1838). SOYAL.

Small hermaphrodite trees with definite head or crown of palmate deeply segmented leaves of a stiff aspect, the blades strongly plicate at base with folds closely pressed together sidewise as in Pritchardia so that the leaf does not have a flat look about the hastula, the blade usually loosely floccose-tomentose when young (at least underneath toward base) but likely to become nearly or quite glabrous at maturity: spadices interfoliar, branched, equalling or exceeding the leaves, bearing small spathelet or bract at each main node, each panicle or separate inflorescence about 3-branched and the ultimate branchlets or rachillæ terete in which the single separate flowers appear to be imbedded at close intervals due to the heavy tomentum that invests them until they are about ready for anthesis: flowers minute, of 3 sepals and 3 petals or corolla-lobes, 6 stamens conspicuous at anthesis within which is a central thick pyramidal pistil of 3 carpels: fruit a drupe-like oblong small body (sometimes 2 or 3 carpels developing), curved on dorsal side, straightish on ventral side and curved over at apex, not exceeding about 6 or 7 mm. in length or more in No. 4, brown or blackish, epiderm very thin; seed with white plain albumen, embryo lateral opposite the raphe.

All Mexican, as far as known.

As ordinarily seen in herbaria the rachillæ are densely tomentose terete branchlets with only indefinite marks or elevations showing: these marks are the flowers not yet emerged to anthesis. Or, one may have old nearly glabrous rachillæ from which flowers have perished, only notches showing where the blossoms were partially imbedded. The blooming stage is between these two extremes, and not of long duration, in which the petals open and the anthers are prominently exposed.

Rachillæ (ultimate flowering branchlets) 4 or 5 cm. or more long and not compacted in close clusters, stout or quill-like and often rigid: petiole bearing marginal teeth: leaf-blade filiferous or thread-bearing.

Petiolar teeth distinctly small, not exceeding about 2-3 and perhaps 4 mm. long, the petiole 2 cm. or more broad in lower part: corolla in bud (just before anthesis) not retuse, without hole in apex, the petals strongly nerved: fruit at maturity glabrous or only thinly loosely pubescent ..... 1. *B. dulcis*

Petiolar teeth mostly 4 mm. or more long, distinctly vitreous-callous, on petiole 1.5 cm. or less broad: corolla in full bud retuse or show-

ing a hole in top, petals not conspicuously nerved: fruit at maturity usually woolly-pubescent or apparently at least shedding its tomentum tardily.....2. *B. Conzattii*

Rachillæ 1-4 cm. long and crowded into a head-like aggregation (Fig. 74): corolla in bud not retuse.....3. *B. Berlandieri*

Rachillæ long and filiform, drooping in very open clusters: petiole without teeth: leaf-blade not filiferous.....4. *B. calcarea*

73. Brahea Conzattii in southern Mexico.

1. **Brahea dulcis,** Martius, Hist. Nat. Palm. iii, 244, tt. 137, 162 (1838). Fig. 72.

Corypha dulcis, HBK. Nov. Gen. et Sp. i, fol. ed. 240 (1815), small ed. 300 (1816).

Erect palm with single trunk 3-6 m. tall and 15-20 cm. thick: leaf-blade nearly orbicular, green, the segments 36-50 and stiffish, linear-acuminate; hastula short and somewhat triangular: spadix 2-3 m. long and much exceeding the leaves, bearing many loose twice- or thrice-branched panicles of somewhat fleshy tomentose rachillæ which are 8-12 cm. or more long and terete: fruit usually single (sometimes more than 1 carpel maturing), obovoid or ovoid, about 6 mm. long, sides compressed, brownish, with very thin edible flesh.

Southern Mexico as known to Humboldt, Bonpland and Kunth and to Von Martius; later accredited to a much wider ter-

ritory in that country but with the recognition of other species the ranges should now be checked. At Palmar in Vera Cruz, about 2000 feet, Fig. 72, *L. H. MacDaniels.* Mazatlan, Sinaloa, *J. G. Ortega.*

B. dulcis var. **montereyensis,** Becc. in Ann. Roy. Bot. Gard. Calcutta, xiii, 304 (1931); in Webbia, ii, 99, *nomen.*

Monterey, Nuevo Leon, northeastern Mexico; presumably the same as *B. Berlandieri.*

2. **Brahea Conzattii,** Bartlett, in Publ. no. 461, Carnegie Inst. Wash. 30 (1935). Fig. 73.

Tree 5-6 m., sometimes more or less procumbent: teeth or spines on petioles conspicuous, strong, sharp, shining brown: individual panicles to 60-80 cm. long: flowers thickly placed on rachis, the buds just before anthesis narrower than long and open at apex: fruit obovoid, about 6 mm. long, tomentose but perhaps more or less nearly glabrous at maturity.

Southern Mexico. Cuesta de Salomé, Oaxaca, *C. Conzatti.* Near Taxco, Guerrero, 5500 feet, Fig. 73, *L. H. MacDaniels,* as the species is at present understood. Yet little known.

3. **Brahea Berlandieri,** Bartlett, l.c. 31. Fig. 74.

Tree and leaves and fruit not described: known by its small condensed panicles (Fig. 74) 13-16 cm. long: corolla bud just before anthesis very short and thicker than long.

Monterey, Nuevo Leon, northeastern Mexico. *Berlandier 3216. Pringle 3030,* Fig. 74.

4. **Brahea calcarea,** Liebm.; Martius, Hist. Nat. Palm. iii, 319 (1850). *B. calcarata,* Hort.

Trunk taller than *B. dulcis:* leaf without filaments; petiole devoid of spines and glabrous on the face: spadix very long; panicles open; rachillæ filiform and long, 15-20 cm., pendulous: fruit described as ovoid, rounded at ends, to 12 mm. or less long and 9 mm. or less broad.

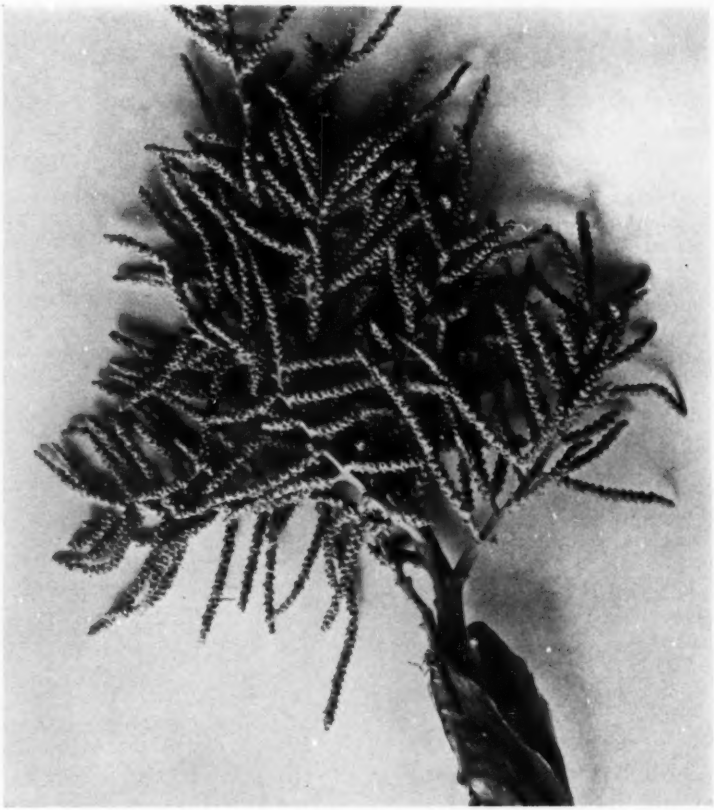
Xalcomulco, Mexico. Drawings at Copenhagen under direction of Liebmann, of which photographs were made by Field Museum, confirm these characteristics.

In southern California several palms are planted as Braheas. They appear to be little known, nor are they listed by dealers as far as I have been able to discover. They appear to have been introduced many years ago, and they seldom blossom. Yet in the light of the foregoing discussion

it will be well to try to understand them, although positive identification is impossible without flowers and fruits. One of them may be an undescribed species.

All the plants I have seen in southern California under the name *Brahea dulcis* are not that genus or species. They are probably Acœlorraphe. Near Santa Barbara, however, I have taken a palm ticketed merely Brahea, and it is almost certainly of that genus and probably *B. dulcis*, as closely as one may judge from a sterile tree.

At J. Harrison Wright's place in Riverside in 1927 I photographed his plant of *Brahea Pimo*, which at that time bore eight leaves and had not developed a trunk; and I made herbarium specimens. The plant was ob-



74. COMPACT FLOWER-CLUSTER of *Brahea Berlandieri*. About one-half size.

tained from Franceschi who first listed it in 1910. This plant has now died. It matches well enough with what is regarded as true *Acœleorraphe Pimo* (the current name) from southern Mexico. Beccari writes in Annals of the Calcutta Botanic Garden, 1931, that his pictures of the fruit of *B. Pimo* are "from a specimen forwarded by Mr. Franceschi from Santa Barbara." Therefore this species should be standing somewhere in California in fruiting condition.

Two or three very different palms are planted as *Brahea calcarea*, not correctly determined. One has nude petioles and whitish under surface of leaves but with nothing to indicate a Brahea. This I have from two places in southern California. Another kind, with spiny petioles may be an Erythea and still another one is perhaps *Acœlorraphe Pimo*.

These rapid comments on trees planted in the United States as Brahea suggest, at least, that we need new careful observations on these palms. Somewhere they must be coming into flower and fruit, and some person should be ready to attack the problem of actual identification.